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DEPARTMENT OF PUBLIC HEALTH

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APPROVED DESIGN DETAILS FOR INSTALLATION AND EXTENSION OF PUBLIC WATER SUPPLIES

Introduction - This bulletin is issued for the guidance of engineers preparing plans and specifications for approval by the State Department of Public Health in accordance with Chapter 63, Section 204, Compiled Statutes of Wyoming, 1945.

Section 1. SUBMISSION OF PLANS - All reports, plans and specifications shall be submitted in duplicate, one copy to be retained on file by the State Department of Public Health and one returned to the owner, at least ten days prior to date upon which action by the Department is desired.

The reports, plans and specifications shall include:

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|-----------------------|--------------------|
| (a) Engineer's report | (c) Detailed plans |
| (b) General plans | (d) Specifications |

Section 2. ENGINEERS REPORT - The engineer's report for waterworks shall cover the following:

(a) Water Consumption. State the present and estimated population for ten and twenty-five years hence for municipalities; for institutions the present and estimated ultimate capacity. Any special conditions that might affect the growth of the municipality or institution; also any industrial activities that may affect the requirements of the water supply should be discussed. Give estimate of the daily total and per capita consumption; both for present and future population.

(b) The Source of Supply. If samples of the water can be obtained, results of chemical and bacteriological analyses shall be included, otherwise the probable character of the water shall be discussed, basing conclusions on analyses or other available information regarding water from similar sources

If a surface supply, the area, population, and a description of the tributary watershed shall be given. All possible sources of pollution, topographical and geographical features of the watershed, and other conditions that might in any way affect the quality or quantity of the supply shall be discussed in detail.

If the source is ground water, give details regarding the number, depth and character of the wells, springs, infiltration galleries, etc., and definite information regarding the various strata. State whether the source is ever subject to flooding.

(c) Purification. State reasons for adopting the method of purification outlined, specifying any experimental work done. Describe completely any special appliances.

(d) Pumping Equipment. The number, type, size and capacity of the pumps to be installed and type of power shall be given. Discuss clearly any special features and method of connecting the pumps with the wells, suction lines, and/or other parts of the system.

(e) Distribution System. State the class, weight and amount of the various sizes of pipe and describe any special features.

(f) Storage. Give amount and location of the storage, both available and proposed, together with details of location and type of structures.

(g) Fire Protection. Discuss adequacy of fire protection with regard to capacity and pressure.

(h) Cost. Give estimated cost of proposed improvements, broken down into principal integral parts of system.

Section 3. GENERAL PLANS - The general plans for waterworks shall show the location of:

- (a) All wells, intakes, or other sources of supply.
- (b) The purification plant.
- (c) All mains, together with their sizes and depth and kind of material.
- (d) All shut-off valves, hydrants, etc.
- (e) Storage or distribution reservoirs.
- (f) Small scale map of watershed.
- (g) Elevation of water surfaces, flood planes, etc.

Section 4. DETAIL PLANS - The scale in feet to which the plans are drawn, the north point, the date and the names of the designer and owner shall in all cases be indicated.

All plans shall be drawn to a suitable scale which for general plans should be not less than 100 feet nor greater than 300 feet to the inch. Plans for modifications or extensions to existing systems or plants shall indicate clearly the connections or relation thereto, and, if not already on file with the State Department of Public Health, submission of plans of the existing system or plant also may be required.

The detail plans for waterworks shall show:

- (a) Details regarding intake pipes, cribs, screens, etc., if water is taken from stream or lake.
- (b) If a ground water supply, details of the well, springs, infiltration gallery, etc., the manner of protecting the supply from surface wash and other pollution. A sketch or statement showing all possible sources of pollution within 500 feet, and the direction of the ground water flow, if known, shall also be submitted.
- (c) Complete details of the purification plant, if proposed, including sedimentation and mixing chambers; collecting and piping systems; method of applying chemicals; filters, including depth, size and uniformity of various strata; rate control; loss of head gauges; washing arrangement; pumps; special devices; etc.
- (d) Details of the pumping station and equipment.
- (e) Any special appurtenances or fixtures in connection with the distribution system.
- (f) Details of elevated tanks, standpipes or reservoirs used for storage of the water.

Section 5. SPECIFICATIONS - Complete specifications for the construction of the purification works or treatment processes, and their appurtenances, of wells and their appurtenances, or of collecting galleries and their appurtenances, shall accompany plans.

REQUIREMENTS FOR DESIGN AND CONSTRUCTION

Section 6. GENERAL - In general, in the design and construction of waterworks, approved modern practice shall be followed. In case new appliances or methods are adopted, sufficient data based upon practical application, experimental or otherwise, shall be submitted to show that satisfactory results can be secured.

Waterworks shall be designed to provide amply for the probable population at least twenty-five years hence, except in considering parts of the system that can be readily increased in capacity. Similar consideration shall be given to the ultimate capacity of institutions.

All materials of construction shall be of approved quality, quantity and proportion.

Auxiliary intakes, bypasses, or cross connections whereby polluted water may be pumped or allowed to flow into the distribution system of any public supply under any conditions will be prohibited, and should not be included in plans for water systems.

Section 7. GROUND WATER SUPPLIES -

(a) General. Sources of ground water supplies shall be located so as to prevent their contamination by surface drainage, flooding at times of high water, or by pollution resulting from proximity to sewers, privy vaults, cesspools, sewage wells, or other sources of contamination.

Collecting or storage reservoirs and clear wells shall be carefully located, be of impervious construction, and be covered. All manholes, vents, drains and overflow openings shall be properly protected from dust, small animals, and willful pollution, and under no conditions be connected to a sewer or installed in a manner such that they will be subject to a backflow of surface water or sewage during high water periods or during periods of sewer line stoppage.

(b) Wells. Well supplies shall be protected from contamination by the following safeguards:

1. A well pit or subsurface level pump room shall be avoided wherever practicable, and the pumps installed on a pump room floor located above the surrounding ground level.
2. If conditions necessitate the installation of a well pit or subsurface level pump room, the floor and walls should be made watertight, and a drain to an open outlet, under no condition connected to a sewer, or a sump and automatic pump ejector shall be provided to remove the waste water. Water activated ejectors are not considered acceptable.
3. The outside casing or curbing of wells shall be extended above the level of the ground floor of the pump room or pit, and a watertight connection installed to close the annular opening between the well casing and pump column or drop pipe. Dug wells shall be provided with a watertight cover, and the pump pipe, manhole and other openings shall be properly protected

so as to prevent waste water or other contaminating material from entering the well. Pumping equipment shall not be installed in the well in a manner requiring entrance of an attendant. In general, dug wells used for municipal water supply should be provided with chlorination equipment.

4. A watertight outside casing or curbing shall be installed, extending deep enough to prevent contaminated surface or shallow ground water or other pollution from entering the well through strata, such as coarse gravel and limestone containing fissures, openings and solution channels. The bottom of the casing or curbing shall be effectively sealed into a solid formation, and thoroughly tested to make certain that contaminated water on the outside of the casing cannot enter the well.

5. Wells installed with a gravel wall shall be protected by forcing into the space between the outside casing and well hole sufficient puddled clay or concrete to give a protective depth of at least 12 feet below the ground surface or any strata carrying contaminated water.

6. Where the water is known or suspected of being corrosive, a metal well casing shall be protected by providing a shell of cement grout at least 2 inches thick around same. An alternate method, suitable in some instances, is the use of a casing consisting of cast iron or best grade wrought iron pipe with a double coating of bituminous material.

7. A separate suction or discharge pipe shall be installed inside a well casing in all instances, whether the well is to be pumped by suction, air lift or deep well pump.

8. On air lift pumping systems, the air inlet shall be properly located and protected to minimize the entrance of dust and other contaminating material.

9. Continuous purification or treatment shall be provided to suit the circumstances, where wells are not provided with the required sanitary safeguards, as outlined above, or where bacteriological or chemical tests, or other conditions indicate that contamination is reaching the water-bearing strata.

10. The specifications of the American Water Works Association covering the construction of drilled wells are recommended by the State Department of Public Health.

(c) Springs. Springs shall be protected from surface contamination by a waterproof concrete curbing and top. Springs which show analytical or field evidence of underground contamination with surface water or sewage shall be effectively purified or treated.

(d) Mine Water. Water from mines subject to contamination or pollution requires adequate purification or treatment to make a safe supply. Special water supply drifts located in mines shall be protected from flooding and drainage from working shafts and drifts.

(e) Infiltration Galleries. Water from infiltration galleries shall receive suitable purification or treatment unless located and operated such that satisfactory bacterial removal is secured.

Section 8. WATER PURIFICATION PLANTS -

(a) General. A flow recording device shall be installed to indicate the quantity of water being treated.

A laboratory is desirable and may be required for larger plants. Certain minimum routine testing equipment may be required.

Collecting or storage reservoirs and suction wells for purified water shall be carefully located, be of water proof construction and covered. All manholes, vents, drains and overflow openings shall be properly protected from waste or flood water, dust, small animals, and willful pollution, and under no condition be connected to a sanitary sewer or installed in a manner such that they will be subject to backflow of surface water or sewage during high water periods.

The return to the purified water system of any water used for cooling purposes, etc., will not be permitted.

(b) Intake. A suitable intake properly screened and located shall be provided for surface supplies.

(c) Pumps. The pumping equipment shall be divided into two or more units except where ample storage is available to permit necessary repairs without interrupting the service. The capacity shall be ample for fire protection and domestic consumption.

(d) Purification. Some modern method of purification, applicable to the need of the municipality or institution, and adaptable to the water to be treated, shall be provided in connection with all surface supplies. In each case, a careful study should be made of the character of the water and experimental work done, if necessary, to determine the type of purification or treatment adaptable.

Purification plants shall be divided into a sufficient number of units to allow for necessary repairs and alterations without interrupting the service or impairing the quality of the water delivered.

1. Application of Chemicals. Adequate devices and apparatus for direct positive and accurate application of coagulating chemical shall be provided.

2. Mixing Chamber. A chamber shall be provided of satisfactory design and capacity to assure adequate mixing of the coagulating chemicals with the raw water.

3. Coagulation and Sedimentation. Coagulation and sedimentation basins shall be provided of adequate capacity and designed so that satisfactory clarification of the raw water, and proper maintenance of the basins, will be assured at all times.

4. Filters. Gravity Rapid Sand Filters. At least two units are recommended, each capable of supplying the entire demand. One unit will be approved provided adequate provision is made in the plans for the addition of a second unit. If more than two units are proposed, this requirement is waived, provided that when one filter is out of service, the other units are of sufficient size to supply the necessary amount of water at the proper rate.

The filtration rate should not exceed two gallons per square foot per day except in the case of iron removal. Separate rate controllers and loss of head gauges shall be provided for all filters. Wash water troughs shall be provided and so designed that the maximum horizontal travel of wash water will not exceed three feet, and the top of the wash water trough shall be two feet above the sand level.

The effective size of the sand shall not be less than 0.3 millimeters nor more than 0.5 millimeters and its uniformity coefficient shall not exceed 1.6. The depth of the filtering sand shall not be less than 24 inches, and it shall be practically pure quartz or silica free from dirt and foreign material. The underdrains shall be so designed that equal distribution is secured over the entire filter during filtration or back-washing.

Adequate means shall be provided for back-washing rapid sand filters with purified water at rates which can be varied from fifteen to twenty-four inches rise of wash water per minute over the area of the sand.

Pressure Filters. This type of filter will not be approved except under special conditions.

5. Iron Removal. Aeration, sedimentation or chemical treatment, or a combination thereof, shall precede filtration for iron removal.

Requirements for filtration units shall be the same as for rapid sand filters, except that the sterilization may ordinarily be omitted.

6. Sterilization. An effective method of sterilization shall be provided for all surface supplies. Duplicate apparatus or spare parts shall be provided so that disinfection without interruption is assured.

Whenever chlorine is the disinfectant agent specified, adequate apparatus shall be provided for making residual chlorine tests.

Section 9. WATER DISTRIBUTION SYSTEM - The distribution system shall be constructed of suitable material and provided with sufficient shut-off valves to facilitate operation and repairs. Where practical, dead ends shall be connected so as to provide adequate circulation of the water. Pipe smaller than six inches in diameter is not recommended for use in municipal systems.

It is recommended that all new water pipes, and existing water mains which have been repaired or opened for the purpose of making extension should be thoroughly disinfected before being put into use.

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